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Additional charges or discounts are listed separately in the statement, with explanations of why they are being used.

The prices included in the price list are used FOB railroad car of the station of origin on a common-carrier railroad, or FOB steamer (barge) of the shipping port, without charge for crating and packing.

In delivering the product from the warehouses of the manufacturing plant to local consumers, electrode products are delivered FOB scales of the manufacturing plant's warehouse.

Loading and transportation of the product is done by the recipient at his own cost and with his own means of transportation.

The containers and packing material for electrode products used by the manufacturing plant must meet the requirements of standard or technical conditions, unless otherwise specified by the customer.

The cost of packing material (crates, lathing, netting, corrugated paper, and other packing material) is not included in the wholesale prices and is to be paid separately by the purchaser in accordance with the average yearly costs of the manufacturing plant.

No special charge is made for marking and stamping the product as provided by the standard or technical conditions.

For electrode products of the types mentioned in the price list, but differing with regard to quality and dimensions, temporary prices are fixed by Glavmetallobyt (Main Administration for the Sale of Metal and Metal Products) in accordance with Soyuzelektrod (All-Union Electrode) Trust, based on prices in the price list for items of similar dimensions, and taking into consideration extra costs in the production of the required dimensions and quality.

Not later than 6 months after forwarding the first shipment, the wholesale prices for electrode products of new dimensions must be approved by the Minister of Metallurgical Industry USSR, in agreement with the ministry ordering the product.

Temporary wholesale prices for new types of electrode products, not specified in the price list, will be determined in the regular manner, in accordance with decree No 2959 of the Council of People's Commissars USSR, dated 23 November 1945.

Prices for electrode products manufactured for experimental purposes (before the prices are fixed) are to be determined by agreement between the manufacturing plant and the purchasing plant. In such cases, the manufacturing plant must, upon receipt of the order and its accompanying technical conditions, notify the purchaser in advance of the price to be charged, explaining the basis for its use, referring to the number and date of the order, and adding substantiating data in the form of estimates and calculations.

Within 5 days after receipt of notification, the purchaser must confirm the same in writing or by telegram to the manufacturing plant, expressing his agreement or submitting a substantiated counteroffer. If no reply is received from the purchaser within the period set by the manufacturing plant, taking into consideration the time of the mail en route and 5 days for preparing the reply, the manufacturing plant may consider this to signify the purchaser's consent and the plant has the right to use the suggested price, which is binding for the purchaser.

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The price agreement becomes invalid as soon as temporary or approved prices for these products go into effect.

If no agreement is reached between the manufacturing plant and the consumer on additional charges, discounts, or prices, the manufacturing plant sends all contestable materials to Glavmetallobyt and the Soyuzelek-trod Trust for examination of the matter, with the participation, if possible, of the purchaser or his representative. In this case, the dispute is decided by Glavmetallobyt, which fixes a temporary price, additional charge, or discount, and this price is binding for the manufacturing plant and the purchasing plants in settling accounts for electrode products delivered in accordance with the terms of the order in question.

The delivery of electrode products direct from the plant is done, as a rule, only in carload lots (car capacity, 16.5 to 20 tons or more). Delivery of electrode products by the manufacturing plant in quantities less than a carload (partial shipment) is done, as a way of exception, in railroad cars with mixed freight or by small shipments, with an extra charge in percent of the wholesale price, as follows:

<u>Type of Product</u>	<u>10-16 Tons</u>	<u>6-10 Tons</u>	<u>Less Than 6 Tons</u>
All graphitized electrodes	5.0	7.5	10.0
All carbon electrodes	10.0	12.5	15.0
Anodes for chemical industry	5.0	7.5	10.0

The following types of products may be shipped in carload lots only: carbon anodes; bottom and sidewall blocks; and anode, electrode, bottom block mass.

To compute the additional charge, the weight of electrode products of all types and dimensions sent to the same consignee is determined. The extent of the additional charge for each type of product is based on the total weight of the entire shipment to one consignee.

In the event of partial shipments, the consignee must inform the manufacturing plant at the time the order is submitted that he agrees to the shipment of the products in railroad cars with mixed freight or in baggage cars. In the case of a shipment by baggage car, the purchaser has to pay the following costs in addition to the regular price and the cost of ordinary crating and packing: cost of delivering freight to the shipping station, fee for weighing, a special fee, and all costs connected with special crating and packing prescribed for goods sent by baggage. An extra charge is not made when the partial shipment occurs through the fault of the manufacturing plant.

In delivering electrode products to purchasers in the same location as the manufacturing plant, directly from the plant and with the purchaser's own means of transportation, no extra charge is made for a partial delivery. If, through the fault of the purchaser, the shipment is not made in one load, the delivery is regarded as partial.

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## II. WHOLESALE PRICES FOR ELECTRODE PRODUCTS

<u>Type of Product</u>	<u>Standards, Tech Conditions</u>	<u>Brand, Type or Grade</u>	<u>Price Per Ton (rubles)</u>
Anodes			
Graphitized	MPTU 2199-49	One grade	6,200
Carbon	TsMTU 1211-41	Highest grade	2,470
		1st grade	2,160
		2d grade	1,800
Blocks for electrolytic cells of aluminum plants	MPTU 2106-49		
Bottom blocks		Highest grade	1,510
		1st grade	1,370
Side blocks		Highest grade	1,360
		1st grade	1,230
Carbon lining blocks			
Finished	TsMTU 2046-48	Highest grade	1,940
		1st grade	1,760
		2d grade	1,580
Unfinished		Highest grade	1,850
		1st grade	1,670
		2d grade	1,500
Carbon blocks and electrodes for carbide furnaces	TsMTU 1228-45		
Finished		Highest grade	1,850
		1st grade	1,580
Unfinished		Highest grade	1,670
		1st grade	1,410
With special finishing		Highest grade	2,110
		1st grade	1,850
Graphitized blocks for anodes of mercury arc rectifiers	TsMTU 2035-47	One grade	24,900 [sic]
Electrode blanks of petroleum coke	TsMTU 1209-41	Highest grade	2,380
204 mm diam		1st grade	2,200
		2d grade	2,070
230 mm diam		Highest grade	2,380
		1st grade	2,200
		2d grade	2,070
255 mm diam		Highest grade	2,290
		1st grade	2,120
		2d grade	2,000

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<u>Type of Product</u>	<u>Standards, Tech Conditions</u>	<u>Brand, Type or Grade</u>	<u>Price Per Ton (rubles)</u>
306 mm diam		Highest grade	2,290
		1st grade	2,120
		2d grade	2,000
357 mm diam		Highest grade	2,460
		1st grade	2,290
		2d grade	2,160
408 mm diam		Highest grade	2,550
		1st grade	2,380
		2d grade	2,240
Carbon anode mass	TsMTU 1214-45	AZhMO	1,410
		AZhM1	1,320
		AZhM2	1,280
		AZhM3	1,230
		ATM	1,320
Carbon mass for bottom lining	TsMTU 1212-45	K	1,410
		A	1,230
Electrode mass	TsMTU 2038-47		660
Graphitized rods	MPTU 2225-49	One grade	6,200
Thermographite (termogرافit)	MPTU 2348-49	One grade	19,100
Carbon tubes for aluminum chlorination	MPTU 2108-49	One grade	11.40
Carbon tubes for electric resistance furnaces	GOST 2645-45		
72/60 mm diam		1st grade	17.60
		2d grade	15.00
96/75 mm diam		1st grade	53.00
		2d grade	48.40
150/110 mm diam		1st grade	123.00
		2d grade	111.00
Carbon tubes for gas purification	TsMTU 1223-43		4,180
Graphitized electrodes, finished (* 1,2)	GOST 4426-48		
75 mm diam		EGO	6,600
		EG1	5,800
		EG2	5,350
100 mm diam		EGO	6,600
		EG1	5,800
		EG2	5,350

} each

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<u>Type of Product</u>	<u>Standards, Tech Conditions</u>	<u>Brand, Type or Grade</u>	<u>Price Per Ton (rubles)</u>
125 mm diam		EG0	6,150
		EG1	5,300
		EG2	4,930
150 mm diam		EG0	6,150
		EG1	5,300
		EG2	4,930
175 mm diam		EG0	5,550
		EG1	4,930
		EG2	4,490
200 mm diam		EG0	5,550
		EG1	4,930
		EG2	4,490
225 mm diam		EG0	5,350
		EG1	4,750
		EG2	4,310
250 mm diam		EG0	5,350
		EG1	4,750
		EG2	4,310
300 mm diam		EG0	5,450
		EG1	4,840
		EG2	4,400
350 mm diam		EG0	5,550
		EG1	4,930
		EG2	4,490
400 mm diam		EG0	6,150
		EG1	5,450
		EG2	4,660
100 x 100 mm		EG0	6,400
		EG1	5,650
		EG2	5,300
150 x 150 mm		EG0	6,400
		EG1	5,650
		EG2	5,300
200 x 200 mm		EG0	5,300
		EG1	4,580
		EG2	4,220
Electrodes for shaft furnaces of magnesium plants	TsMTU 1224-44		
Carbon electrodes, baked			1,670
Petroleum electrodes, baked			1,940

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<u>Type of Product</u>	<u>Standards, Tech Conditions</u>	<u>Brand, Type or Grade</u>	<u>Price Per Ton (rubles)</u>
Graphitized electrodes			4,400
Current-carrying electrodes for graphitizing furnaces	TsMTU 1227-45		
Carbon		Highest grade	1,940
		1st grade	1,760
Graphitized, 200 x 200 mm		Highest grade	4,840
		1st grade	4,490
Graphitized, 400 x 400 mm		Highest grade	5,650
		1st grade	5,300
Carbon electrodes, finished (* 2,3,4)	GOST 4425-48		
100 mm diam		EU0	2,820
		EU1	2,460
		EU2	2,110
150 mm diam		EU0	2,730
		EU1	2,380
		EU2	2,020
200 mm diam		EUC	2,640
		EU1	2,290
		EU2	1,940
225 mm diam		EU0	2,640
		EU1	2,290
		EU2	1,940
250 mm diam		EU0	2,290
		EU1	2,020
		EU2	1,760
275 mm diam *		EU0	2,290
		EU1	2,020
		EU2	1,760
300 mm diam		EU0	2,200
		EU1	1,940
		EU2	1,670
350 mm diam		EU0	2,200
		EU1	1,940
		EU2	1,670
400 mm diam		EU0	2,640
		EU1	2,290
		EU2	2,020
Carbon electrodes for electrothermic processes (*3)	MPTU 2290-49		

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<u>Type of Product</u>	<u>Standards, Tech Conditions</u>	<u>Brand, Type or Grade</u>	<u>Price Per Ton (rubles)</u>
500 mm diam		1st grade	2,020
		2d grade	1,850
700 mm diam		1st grade	1,760
		2d grade	1,670

\* 1. When delivering unfinished graphitized electrodes, a 15-percent discount is allowed from the regular price for the corresponding size and grade.

\* 2. If the purchaser requests delivery of nipples without electrodes, the cost of the nipples is computed on the basis of the regular price for the highest grade of electrodes of the corresponding size, with a 10-percent price increase.

\* 3. When delivering unfinished carbon electrodes, a 15-percent discount from the regular price for the corresponding size and grade is allowed.

\* 4. Contact paste, when delivered to purchasers at their request in amounts exceeding the standard amount of 5 kilograms per ton of electrodes, must be paid for separately at the rate of 4 rubles per kilogram.

### III. GOST (STATE ALL-UNION STANDARD) AND TECHNICAL CONDITIONS

#### 1. Graphitized Anodes, MPTU 2199-49

According to the requirements of existing technical conditions, graphitized anodes are intended for use in electrolytic baths of the diaphragm type and with a mercury cathode.

There is only one grade of graphitized anodes and they may have the following geometrical forms: circular, cylindrical-shaped, or rectangular or square.

The sizes of anodes and tolerances must be in accordance with Table 1.

Table 1

<u>Name of Product</u>	<u>Cross Section (mm)</u>	<u>Length (mm)</u>	<u>Tolerance</u>	
			<u>Cross Section (mm)</u>	<u>Lengthwise (%)</u>
Graphitized anodes	51 x 51	970	± 2	± 1
	50 x 180	1,000	± 3	± 3
	90 x 125	490	± 3	± 3
	Diam 63	400	± 2	± 5

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<u>Name of Product</u>	<u>Cross Section (mm)</u>	<u>Length (mm)</u>	<u>Tolerance</u>	
			<u>Cross Section (mm)</u>	<u>Lengthwise (%)</u>
Graphitized anodes for mercury baths	Diam 55	415	$\pm 2$	$\pm 5$
	60 x 175	340	$\pm 2.5$	$\pm 3$
	60 x 175	500	$\pm 2.5$	$\pm 3$
	60 x 175	680	$\pm 2.5$	$\pm 3$
	60 x 175	230	$\pm 2.5$	$\pm 3$
	60 x 175	210	$\pm 2.5$	$\pm 3$
	Diam 70	280	$\pm 3, -0$	$\pm 3$
	Diam 68.5	280	$\pm 3, -0$	$\pm 3$
	Diam 65	280	$\pm 3, -0$	$\pm 3$

Table 2. With regard to physicochemical indexes, anodes must conform with

Table 2

<u>Designation of Index</u>	<u>Unit of Measurement</u>	<u>Size of Index</u>
Specific electrical resistance	Ohms per sq mm/m	9.5 (max)
Ash content	Percent	0.7 (max)
Mechanical compression strength	kg/sq cm	200 (min)

The quality of anodes is determined by the following indexes of their outer surface: curvature, chips, blisters, and cracks.

Anodes are delivered in wooden boxes with interlayers of straw or shavings.

## 2. Carbon Anodes, TsMTU 1211-41

Carbon anodes are made of carbon materials of low ash content and are used as current-conductors in the electrolytic process of aluminum production. The anodes are prism-shaped with a slight taper, which is included in the tolerances.

Sizes and tolerances of anodes are in accordance with Table 3.

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Table 3.

<u>Dimension</u>	<u>mm</u>	<u>Tolerance</u> (mm)
Length	550	$\pm 10$ , - 15
Width	400	$\pm 10$ , - 15
Height	400	$\pm 20$ , - 30

In regard to physicochemical indexes and outer appearance, anodes are divided into three grades: highest grade, first grade, and second grade. The physicochemical indexes of anodes must conform with Table 4.

Table 4.

<u>Grade</u>	<u>Max Ash</u> <u>Content</u> (%)	<u>Fe<sub>2</sub>O<sub>3</sub></u> <u>Content</u> (%)	<u>Max</u> <u>SiO<sub>2</sub></u> <u>Content</u> (%)	<u>Max</u> <u>Porosity</u> (%)	<u>Mir</u> <u>Resistance</u> <u>to Pushing</u> (kg per sq cm)	<u>Remarks</u>
Highest	0.5	0.15	0.20	25	300	Al <sub>2</sub> O <sub>3</sub> content is not included in total ash content
First	0.8	0.25	0.30	26	270	
Second	1.0	0.35	0.40	27	200	

3. Lining Blocks (Bottom and Side) for Electrolytic Aluminum Baths, MPTU  
2106-49

The sizes and tolerances of blocks must conform with Table 5.

Table 5.

<u>Dimension</u>	<u>Bottom Blocks</u> (mm)	<u>Side Blocks</u> (mm)	<u>Tolerances</u>	
			<u>Bottom Blocks</u> (mm)	<u>Side Blocks</u> (mm)
Length	550	550	$\pm 10$	$\pm 10$
Width	400	400	$\pm 10$	$\pm 10$
Height	400	115	$\pm 20$	$\pm 10$

NOTE: The length of bottom blocks may be reduced at the request of the purchaser.

Two grades of blocks are distinguished, depending on physicomechanical indexes and the condition of the outer surface. The physicomechanical indexes must conform with Table 6.

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Table 6.

<u>Type of Product</u>	<u>Max Ash Content (%)</u>	<u>Max Porosity (%)</u>	<u>Min Resistance to Crushing (%)</u>
Bottom blocks			
Highest grade	7	16	350
First grade	7	18	300
Side blocks			
Highest grade	7	18	300
First grade	7	20	250

4. Graphitized Blocks for Anodes of Mercury-arc Rectifiers, TsMTU  
2035-47

Graphitized blocks are made of carbon material with a low ash content and are transformed by mechanical treatment into anodes and grids for mercury-arc rectifiers with a pressure up to 850 atms.

Dimensions and tolerances for graphitized blocks must be as indicated in Table 7.

Table 7.

<u>Diameter (mm)</u>	<u>Length (mm)</u>
150 ± 5	150 ± 5
200 ± 5	215 ± 5
285 ± 5	250 ± 5

The physicochemical indexes of the blocks must conform with Table 8.

Table 8.

<u>Name of Index</u>	<u>Size of Index</u>
Ash content, max	0.1%
Calcium content, max	0.003%
Sulfur content, max	0.05%
Mechanical compression strength, min	220 kg/sq cm
Porosity, max	26%

The material of blanks must be of such a nature as to permit the cutting of buttress threads, with a dimension of 36 x 6 (OST 2410), without chipping the thread. No cracks are permitted. Chipping of edges over 10 mm is not allowed. The blocks are transported in wooden cases with paper or dry shavings interlaid between each block.

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## 5. Carbon Blocks for Lining, TsMTU 2046-46

Carbon blocks for lining are delivered with finished or unfinished surfaces. Dimensions and tolerances, both of cross section and length, must conform with Table 9.

Table 9.

<u>Cross Section</u> (mm)	<u>Length</u> (mm)	<u>Side Tolerance</u> (mm)	<u>Length Tolerance</u> (%)
50 x 180	400 to 1,000	± 5	± 5
100 x 100	400 to 1,000	± 8	± 5
200 x 200	300 to 1,800	± 20	± 5
300 x 300	400 to 1,800	± 30	± 5
115 x 400	400 to 2,000	± 20	± 5
400 x 400	400 to 2,000	± 30	± 5
400 x 400	550	± 20	± 5

According to mechanical properties, the blocks are divided into three grades:

<u>Grade</u>	<u>Min Resistance to Crushing</u> (kg/sq cm)
Highest	250
First	200
Second	180

## 6. Carbon Electrodes and Blocks for Carbide Furnaces, TsMTU 1228-45

Dimensions must meet specifications of purchaser. The physico-mechanical indexes must conform to Table 10.

Table 10.

<u>Grade</u>	<u>Max Specific Electric Resistance</u> (ohms per sq mm/m)	<u>Min Resistance to Crushing</u> (kg/sq cm)
Highest	55	250
First	65	170

NOTE: According to the customer's wisher, these products may be delivered either finished or unfinished, or may be specially processed.

## 7. Electrode Blanks of Petroleum Coke

The blanks are intended for the production of graphitized electrodes and are used by plants of the electrode industry in accordance with technical conditions confirmed by "Soyuzelektrod" Trust.

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## 8. Carbon Anode Mass, TsMTU 1214-45

The mass is manufactured in two different types: AZhM, a fatty anode mass, used for building up anodes in operation; and ATM, a lean anode mass, used for packing anodes when setting up electrolytic cells.

Type ATM mass is manufactured by special order. The ash content may be as follows:

<u>Grade</u>	<u>Standard Designation</u>	<u>Ash Content (%)</u>
Zero	AZnM-0	0.45
First	AZhM-1	0.65
Second	AZhM-2	0.85
Third	AZhM-3	1.25

The mechanical strength should not be less than 270 kg/sq cm. Specific electric resistance should not exceed 100 ohms per sq mm/m. Porosity should not exceed 32 percent.

## 9. Carbon Mass for Bottom Lining, TsMTU 1212-45

The mass for bottom lining is made according to two types: K, coke mass; and A, anthracite mass. It is used for lining electrolytic cells.

## 10. Electrode Mass, TsMTU 2038-47

Electrode mass is intended for self-caking continuous electrodes in electrometallurgical processes. The chemical indexes must be as follows: ash content, not over 10 percent; content of volatile matter, from 14 to 18 percent.

## 11. Graphitized Rods, MPTU 2225-49

Graphitized rods are made of carbon materials with a low ash content and are used in electric resistance furnaces for melting metallic cobalt.

The dimensions and tolerances are as follows: diameter,  $32 \pm 2$  mm; length, 550 + 50 mm. At the request of the purchaser, the length of rods may be reduced. Only one grade of rods is made and the surface is unfinished. The specific electric resistance of rods is not over 10 ohms per sq mm/m.

The condition of the outer surface, curvature, chips, cracks, and blisters, are regulated by current technical conditions.

The rods are delivered in wooden cases, interlaid with straw or shavings.

## 12. Thermographite (termogرافit), MPTU 2348-49

Thermographite is a product of the heat treatment of anthracite of thermoanthracite and serves as a raw material for the production of colloidal graphite. Thermographite must meet the following requirements:

1. Outer appearance - graphite pieces must feel "fatty" to the touch and should not contain any impurities.
2. Color - the surface of a cut should be silvery gray.
3. Degree of graphitization - graphite pieces may be cut with a knife and should not contain impurities of ungraphitized anthracite.

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4. Ash content in thermographite - not over 0.5 percent.
5. Content of foreign matter not soluble in hydrochloric acid - not over 0.25 percent.
6. Moisture of thermographite - not over 0.2 percent.
7. Capacity to swell - not over 0.8 (degree of immersion into water).

NOTES: 1. A moisture content above that mentioned in point 6 is not a cause for rejection and the weight of moisture above 0.2 percent is not included in the weight of the delivered thermographite.

11. The maximum moisture content must not exceed 10 percent.
111. Thermographite is delivered in paper or wooden packing material.
13. Carbon Tubes for Aluminum Chlorination, MPTU 2108-49

Dimensions and tolerances: outside diameter,  $32 \pm 2.0$  mm; inside diameter,  $24 \pm 2.0$  mm; length,  $1,300 \pm 20$  mm.

At the purchaser's request, the length of tubes may be reduced. In outer appearance, the tubes must conform to requirements of existing technical conditions which determine such factors as cracks, chips, and curvature.

The tubes are delivered in wooden boxes interlaid with straw or shavings.

14. Carbon Tubes for Electric Resistance Furnaces, GOST 2845-45

The electrode industry manufactures carbon tubes in the sizes indicated in Table 11.

Table 11.

		First Grade			Second Grade		
<u>Diameter</u>		<u>Outside</u>	<u>Inside</u>	<u>Permis-</u>	<u>Outside</u>	<u>Inside</u>	<u>Permis-</u>
<u>side</u>	<u>side</u>	<u>Diameter</u>	<u>Diameter</u>	<u>sible</u>	<u>Diameter</u>	<u>Diameter</u>	<u>sible</u>
<u>(mm)</u>	<u>(mm)</u>	<u>Tolerance</u>	<u>Tolerance</u>	<u>Diff in</u>	<u>Tolerance</u>	<u>Tolerance</u>	<u>Diff in</u>
		<u>(mm)</u>	<u>(mm)</u>	<u>Wall</u>	<u>(mm)</u>	<u>(mm)</u>	<u>Wall</u>
				<u>Thickness</u>			<u>Thickness</u>
				<u>(mm)</u>			<u>(mm)</u>
72	60	- 3.5	$\pm 2.0$	0.8	- 4.0	$\pm 2.0$	1.2
96	75	$\pm 2.5$	+ 3.0	1.5	$\pm 3.0$	+ 4.0	2.0
150	110	$\pm 3.0$	$\pm 4.0$	2.0	$\pm 4.0$	$\pm 4.0$	2.5

NOTES: 1. For first-grade tubes with an outside diameter of 150 mm, used for screening, the tolerance for the outside diameter is  $\pm 4$  mm and for the inside diameter  $\pm 5$  mm.

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11. Only two grades of tubes are manufactured (first and second), with a length of 1,050 mm, which may vary  $\pm 3$  mm.

11i. By agreement with the purchaser, the tubes may be delivered with unfinished ends.

The specific electric resistance of the tubes must be within the range of 40 to 80 ohms per sq mm/m.

In the case of tubes for shields and immersion heating units (lodochki), electric resistance is not standardized.

#### 15.. Carbon Tubes for Electric Precipitators, TsMTU 1223-43

Carbon tubes are used for gas purification. A set of tubes consists of two tubes and two plates. Dimensions and tolerances of the tubes are as follows: inside diameter,  $250 \pm 5$  mm; outside diameter,  $350 \pm 5$  mm or  $-10$  mm; overall length of tubes when rolled up,  $3,600 \pm 20$  mm or  $-40$  mm; length of each half of tube, with its threaded part,  $1,800 \pm 10$  mm.

NOTE: It is permissible to deliver a shipment of tubes with deviations of  $\pm 100$  mm from the standard length, on condition that the upper and lower part of the tube is of equal length, and that these irregular lengths make up not more than 10 percent of the total shipment of tubes.

The dimensions of the plates are as follows: width,  $230 \pm 5$  mm; length,  $440 \pm 3$  mm; height,  $100 \pm 5$  mm.

Physicochemical indexes: ash content not over 8 percent. Degree of disintegration (acid resistance): not over 1.5 percent. Resistance to crushing: not under 250 kg/sq cm.

The tubes are finished (machined) in accordance with the sketch outlined in Figure 1.

#### 16. Graphitized Electrodes and Nipples for Electric-arc Furnaces, GOST 4426-48

1. The dimensions of graphitized electrodes for electric-arc furnaces are determined in accordance with Table 12.

2. The dimensions of cylindrical threads of nipple sockets in electrodes and of nipples must conform to figures 2, 3 and 4, and table 13.

If the pitch of the thread is 8.47 mm, the angle of taper of the ends is: for the nipple thread,  $-30^\circ$ ; for the nipple socket,  $-25^\circ$ .

If the pitch of the thread is 12.7 mm, the angle of taper of the ends is: for the nipple thread,  $-43^\circ$ ; for the nipple socket,  $-33^\circ$ .

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Table 12.

<u>Diam</u> (mm)	<u>Tolerances</u> <u>for Diam</u> (mm)	<u>Length</u> (mm)	<u>Tolerances</u> <u>for Length</u> (mm)
75		1,000	
75		1,200	
100		1,000	± 100
130	± 2.5	1,200	± 120
125			
150			
150			
175			
200		1,500	± 150
225			
250	± 3.0		
300			
350	± 3.5		
400			
100 x 100		1,000	
150 x 150		1,200	± 100
200 x 200		1,500	
300 x 300	± 5.0	1,500	± 150

NOTES: 1. Electrodes with a diameter of 200 mm and more may be delivered in quantities of up to 10 percent of a shipment of shorter lengths; however, not under one meter.

- ii. Electrodes with a square cross section may, at the request of the purchaser, differ in length from the dimensions given in Table 12.
- iii. The buttress thread with a pitch of 8.47 mm for electrodes and nipples is determined as in Figures 2 and 3 and Table 13.

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Table 13.

Diam of Elec- trode (mm)	<u>Dimensions of Nipple (mm)</u>						<u>Dimensions of Nipple Socket (mm)</u>						<u>Clear- ance</u>  <u>a</u>
	<u>Diameters</u>			<u>Length</u>			<u>Diameters</u>			<u>Depth</u>			
	<u>A</u>	<u>Toler- ance</u>	<u>B</u>	<u>Toler- ance</u>	<u>C</u>	<u>Toler- ance</u>	<u>A<sub>1</sub></u>	<u>Toler- ance</u>	<u>B<sub>1</sub></u>	<u>Toler- ance</u>	<u>C<sub>1</sub></u>	<u>Toler- ance</u>	
75	41.2	-0.5	33.8	-0.5	103	-1.0	42.5	+0.5	35.1	+0.5	53	+0.5	1.5
100	66.7	-0.5	59.3	-0.5	135	-1.0	68.0	+0.5	60.6	+0.5	69	+0.5	1.5
125	69.8	-0.5	62.4	-0.5	153	-1.0	71.1	+0.5	63.7	+0.5	78	+0.5	1.5
150	88.9	-0.5	81.5	-0.5	169	-1.0	90.2	+0.5	82.8	+0.5	86	+0.5	1.5
175	101.6	-0.5	94.2	-0.5	169	-1.0	102.9	+0.5	95.5	+0.5	86	+0.5	1.5
200	122.2	-0.5	114.8	-0.5	203	-1.0	123.5	+0.5	116.1	+0.5	103	-0.5	1.5

iv. The buttress thread with a pitch of 12.7 mm for electrodes and nipples is determined as in Figures 2 and 4 and Table 14.

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Table 14.

Diam of Elec- trode (mm)	<u>Dimensions of Nipple (mm)</u>						<u>Dimensions of Nipple Socket (mm)</u>						<u>Clear- ance</u>  <u>a</u>
	<u>Diameters</u>		<u>Length</u>				<u>Diameters</u>		<u>Depth</u>		<u>Toler- ance</u>		
	<u>A</u>	<u>Toler- ance</u>	<u>B</u>	<u>Toler- ance</u>	<u>C</u>	<u>Toler- ance</u>	<u>A<sub>1</sub></u>	<u>Toler- ance</u>	<u>B<sub>1</sub></u>	<u>Toler- ance</u>		<u>C<sub>1</sub></u>	
225	139.7	-0.5	128.8	-0.5	203	-1.0	14.4	+0.5	130.5	+0.5	103	+0.5	1.5
250	152.4	-0.5	141.5	-0.5	228	-1.0	154.1	+0.5	143.2	+0.5	116	+0.5	2.0
300	184.2	-0.5	173.3	-0.5	254	-1.0	185.9	+0.5	175.0	+0.5	129	+0.5	2.0
350	215.9	-0.5	205.0	-0.5	280	-1.0	217.6	+0.5	206.7	+0.5	142	+0.5	2.0
400	244.5	-0.5	233.6	-0.5	305	-1.0	246.2	+0.5	235.3	+0.5	155	+0.5	2.5

v. With regard to specific resistance, graphitized electrodes must conform to requirements of Table 15.

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Table 15.

Max Specific Electric Resistance  
(ohms per sq mm/m)

<u>Type of Electrode</u>	<u>0-10 mm</u>	<u>125-200 mm</u>	<u>225 mm and Over</u>
EG0	9	9.5	10
EG1	10	11	12
EG2	11	13	14

vi. Mechanical strength (degree of resistance to compression) of electrodes of all types must not be less than 160 kg/sq cm, and the mechanical strength of nipples must not be less than 200 kg/sq cm.

vii. Circular electrodes are delivered with nipple sockets threaded from two sides, complete with nipples at the rate of one nipple per electrode.

NOTE: At the request of the purchaser, electrodes and nipples may be delivered separately.

In determining the grade or type of electrode, the condition of the outer surface (cracks, chips, curvature, etc.) is also taken into consideration.

The permissible current density (a/sq cm) in operation is recommended in accordance with Table 16.

Table 16.

<u>Type of Electrode</u>	<u>Diameter of Electrodes (mm)</u>											
	<u>5</u>	<u>100</u>	<u>125</u>	<u>150</u>	<u>175</u>	<u>200</u>	<u>225</u>	<u>250</u>	<u>275</u>	<u>300</u>	<u>350</u>	<u>400</u>
	(max a/sq cm)											
EG0	28	28	26	24	22	20	20	18	17	17	16	15
EG1	25	26	24	21	20	18	16	16	16	16	15	14
EG2	24	24	22	18	17	16	16	15	15	15	14	13

Electrodes and nipples are delivered in the following containers:

1. Electrodes with a diameter of up to 200 mm are packed in solid wooden boxes, interlaid with straw or shavings.

Electrodes with a diameter of 225 mm and more are packed in wooden latticed boxes.

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2. Nipples are packed in solid wooden boxes, interlaid with corrugated paper, straw, or shavings.

17. Electrodes for Shaft Furnaces of Magnesium Plants, TsMTU 1224-44.

Electrodes for shaft furnaces are divided into three types: baked carbon, baked petroleum, and graphitized

The dimensions of electrodes should be not less than 50 x 50 x 50 mm and they may be circular or rectangular.

The ash content should not exceed 10 percent.

18. Current-carrying Electrodes for Graphitizing Furnaces, TsMTU 1227-45

Of electrodes used as current-carrying or lining electrodes in graphitizing furnaces, the cross section, length, and tolerances should conform to the customer's specifications.

NOTE: The need for special mechanical treatment, such as surface planing, drilling of holes, etc., is discussed with the purchaser at the time the order is given.

The electrode surface must be clean and smooth. The specific electric resistance should conform to requirements set forth in Table 17.

The mechanical strength of electrodes (resistance to compression) for all types and grades must not be less than 150 kg/sq cm.

Table 17.

<u>Grade</u>	<u>Graphitized Electrodes</u> (max ohms per sq mm/m)	<u>Carbon Electrodes</u> (max ohms per sq mm/m)
Highest	17	55
First	20	60

19. Carbon electrodes for electric-arc furnaces, GOST 4425-48.

1. The dimensions of carbon electrodes for electric-arc furnaces are determined as follows:

Table 18.

<u>Diam of Electrode</u> (mm)	<u>Permissible Tolerances For Diam</u> (mm)	<u>Length of Electrode</u> (mm)	<u>Permissible Tolerance For Length</u> (mm)
100		1,000	± 100
150	± 2.5	1,200	± 120

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<u>Diam of Electrode (mm)</u>	<u>Permissible Tolerance For Diam (mm)</u>	<u>Length of Electrode (mm)</u>	<u>Permissible Tolerance For Length (mm)</u>
150			
200			
225			
250	$\pm 3.0$		
275		1,500	$\pm 150$
300			
350	$\pm 3.5$		
400			

NOTE: It is permissible to deliver shorter electrodes, but not shorter than one meter, in quantities up to 10 percent of the entire shipment.

2. The dimensions of the cylindrical thread of nipple sockets in electrodes and of nipples, as well as permissible tolerances, must conform to Table 19, and Figure 5.

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Table 19.

Dimensions of Nipples (mm)										Dimensions of Nipple Sockets (mm)									
Elec- trode Diam	A	Permis- sible Toler- ance	B	Permis- sible Toler- ance	C	Permis- sible Toler- ance	D	E	Permis- sible Toler- ance	F	Permis- sible Toler- ance	G	Permis- sible Toler- ance	H	Permis- sible Toler- ance	I	J	K	
150	84.5	-1.0	70.5	-1.0	203	-1.0	153	25	-2.0	72.5	+1.0	86.5	+1.0	104.5	+1.0	5.96	5.96	20	
200	115	-1.0	95	-1.0	290	-1.0	240	25	-2.0	99	+1.0	119	+1.0	148	+1.0	11	7.4	30	
225	115	-1.0	95	-1.0	290	-1.0	240	25	-2.0	99	+1.0	119	+1.0	148	+1.0	11	7.4	30	
250	140	-1.0	120	-1.0	310	-1.0	260	25	-2.0	124	+1.0	144	+1.0	158	+1.0	11	7.4	30	
275	140	-1.0	120	-1.0	310	-1.0	260	25	-2.0	124	+1.0	144	+1.0	158	+1.0	11	7.4	30	
300	160	-1.5	140	-1.5	310	-1.5	260	25	-2.0	144	+1.5	164	+1.5	158	+1.5	11	7.4	30	
350	190	-1.5	160	-1.5	370	-1.5	320	25	-2.0	165	+1.5	195	+1.5	188	+1.5	13	9.7	40	
400	210	-1.5	180	-1.5	370	-1.5	320	25	-2.0	185	+1.5	215	+1.5	188	+1.5	13	9.7	40	

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3. With regard to specific electric resistance, the electrodes must conform to Table 20.

Table 20.

<u>Type of Electrode</u>	<u>Specific Electric Resistance</u>	
	<u>100-275 mm Diam</u>	<u>300-400 mm Diam</u>
	(max ohms per sq mm/m)	
EU0	42	45
EU1	47	50
EU2	52	55

4. Mechanical strength (degree of resistance to compression) of electrodes and nipples of all types must be not less than 200 kg/sq cm.

5. Electrodes are delivered in complete sets with nipples and paste, at the rate of one nipple for each electrode and 5 kilograms of paste for one ton of electrodes.

NOTE: At the request of the purchaser, electrodes, nipples, and paste may be delivered separately.

In determining the grade (or type) of electrodes, the condition of the outer surface (cracks, chips, curvature, etc.) is taken into consideration. The recommended current density of electrodes in operation must conform to Table 21.

Table 21.

<u>Type of Electrode</u>	<u>Diameter of Electrode (mm)</u>							
	<u>0-150</u>	<u>200</u>	<u>225</u>	<u>250</u>	<u>275</u>	<u>300</u>	<u>350</u>	<u>400</u>
			(max a/sq cm)					
EU0	11	10	10	9	9	8	8	7
EU1	10	9	9	8	8	7	6.5	6
EU2	9	8	8	7	7	6	6	5.5

Electrodes and nipples are delivered as follows:

1. Electrodes with a diameter up to and including 200 mm are packed in solid wooden boxes, interlaid with straw or shavings.

Electrodes with a diameter of 225 mm and more are packed in wooden latticed boxes.

2. Nipples are packed in solid wooden boxes, interlaid with corrugated paper, straw, or shavings.

20. Carbon Electrodes for Electrothermic Processes, MPTU 2290-49

Carbon electrodes for electrothermic processes are intended for use in the production of abrasives, electrothermic phosphorus, etc. The dimensions and tolerances must be in accordance with Table 22.

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Table 22.

Diam of electrode (mm)	500 $\pm$ 5%	700 $\pm$ 5%
Length of electrode (mm)	1,750 - 2,500	200 - 2,750 [ <u>sic</u> ]
Diam of electrode neck (mm)	-	500 $\pm$ 8
Length of electrode neck (mm)	-	600 $\pm$ 10

Electrodes are delivered finished or unfinished. At the request of the purchaser, electrodes may be delivered without a thread, or with one or two threaded ends. Electrodes with a diameter of 700 mm are made with a groove for special clamping.

The physicomechanical indexes of electrodes must conform with Table 23.

Table 23.

<u>Grade</u>	<u>Specific Electric Resistance</u> (max ohms per sq mm/m)	<u>Mechanical Resistance To Compression</u> (min kg/sq cm)
First	60	200
Second	70	170

In determining the grade of electrodes, the indexes of their outer surface, such as curvature, chips, and cracks, are taken into consideration. Electrodes of this type are delivered without packing.

## IV. TABLES OF WEIGHTS FOR ELECTRODE PRODUCTS

1. Approximate weight of one running meter of electrodes, manufactured by the press-broaching method:

<u>Size</u> (mm)	<u>Graphitized Electrodes</u> (kg)	<u>Carbon Electrodes</u> (kg)
Diam		
75	7.0	--
100	12.6	12.2
150	28.2	27.4
200	50.3	48.7
225	63.9	61.8
250	78.5	76.2
275	95.0	92.2
300	112.8	109.5
350	153.5	150
400	200.5	195
500	--	304
700	--	597

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<u>Size</u> (mm)	<u>Graphitized</u> <u>Electrodes</u> (kg)	<u>Carbon</u> <u>Electrodes</u> (kg)
Rectangular		
50 x 180	--	11
100 x 100	--	12.2
200 x 200	--	48.7
300 x 300	--	109.5
115 x 400	--	56
400 x 400	--	195

## 2. Weight of electrodes for chemical industry:

<u>Item</u>	<u>Dimensions</u> (mm)	<u>Weight of Unit</u> (kg)
Graphitized anodes	51 x 51 x 970	4.2
	50 x 180 x 1,000	14.7
	90 x 125 x 490	9.8
	Diam 63, length 400	2
	Diam 55, length 415	1.6
Graphitized anodes for mercury baths	60 x 175 x 340	5.8
	60 x 175 x 500	8.6
	60 x 175 x 680	11.7
	60 x 175 x 230	4
	60 x 175 x 210	3.6
	Diam 70, length 280	1.8
	Diam 68.5, length 280	1.7
	Diam 65, length 280	1.5

3. Weight of lining blocks for aluminum industry: bottom blocks (400 x 400 x 550 mm), 143 kg in one block; side blocks (400 x 115 x 550 mm), 41 kg in one block.

4. Weight of carbon tubes for electric precipitators: one set (two tubes, screwed together, and two plates), 330 kg.

5. Weight of carbon tubes for hard alloys: 72 x 60 x 500 mm, 1 kg in one tube; 96 x 75 x 1,000 mm, 4.5 kg in one tube; 150 x 110 x 900 mm, 12.0 kg in one tube.

6. Weight of carbon anode for aluminum industry: (400 x 400 x 550 mm), 138 kg.

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NOTE: The indicated weights for different dimensions of electrodes must be considered approximate and are not obligatory for electrode plants in the settlement of accounts with purchasers.

The delivery of products to consumers is done according to actual weight.

#### V. INSTRUCTIONS FOR HANDLING AND OPERATION OF ELECTRODES

The following instructions contain rules for the transport, storage and use of electrodes; these rules are obligatory for all workers of the metallurgical industry.

All electrodes and nipples delivered at a plant must be received by a representative of OTK (Technical Tests Division) of the purchasing plant. Tests are made to determine whether the quality of the electrodes is in accordance with data contained in the certificate and existing technical conditions or standards. In the event discrepancies are found, a document describing the defects is prepared and a representative of the manufacturing plant is summoned for a joint settlement of claims.

##### Transportation of Electrodes

1. Unloading of electrodes from railroad cars must be done very carefully, taking precautions against possible chipping and scratching. It is not permitted to throw either packed or unpacked electrodes out of the railroad cars, or to hit electrodes against each other or against other objects.

2. When transporting electrodes by truck, it is necessary to make the electrodes secure in the body of the truck, guarding them against knocks and bumps, and to cover them with a tarpaulin for protection against rain.

3. Nipples must be transported in boxes interlaid with shavings or corrugated paper.

4. In transporting electrodes it is absolutely forbidden:

- a. to use a metal crowbar as a lever for moving electrodes
- b. to use iron "claws" for grabbing electrodes by the nipple sockets.

##### Storage of Electrodes

1. Electrodes must be stored in a covered, dry, and clean building having a wooden floor (if possible, not far from the stove). It is not permissible to store electrodes on an open platform.

2. It is advisable to store electrodes on special metal racks in a horizontal position. In the absence of special racks, electrodes should be stacked in piles of not more than four or five layers, with each layer separated by wooden bars. The electrodes at the end of each row are kept from sliding by wedges fastened to the boards. The bottom layer of electrodes is laid on an even wooden floor or on wooden boards. It is not permissible to store electrodes in stacks without separating them by wooden bars or boards.

3. Nipples must be stored in closed wooden boxes or chests in a vertical position. Nipples should be unpacked in the immediate area of the steel-smelting furnace.

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4. The stacking of electrodes in piles may be done by cranes or by hand with the help of ropes. It is absolutely forbidden to:

- a. store electrodes near clay, sand, or other soiling materials
- b. stack electrodes on a cement or brick floor.

Operation of Electrodes

1. Because of the capacity of electrodes to absorb moisture from the air, it is necessary to dry the electrodes in special chambers at a temperature of 150 degrees /centigrade/ before installing them in a furnace, or to dry them on platforms near the open-hearth or heat-treatment furnaces for a period of not less than 36 hours.
2. To protect the electrodes from being scorched above the furnace roof, it is absolutely necessary to equip the furnaces with economizers. It is advisable to use water-cooled economizers with tapered sealing plates, filled with asbestos wool. These economizers protect the electrodes from scorching, without hindering the vertical movement of the electrodes.
3. The clamps of electrode holders must be absolutely secure and the entire surface of the clamps must come into contact with the electrode. There should be no beads or blisters on the working surface of the electrode holder jaws. Before clamping the electrodes, the jaws are cleaned of scale with metal brushes.
4. Before installing the electrodes, the working order of the mechanical part of the furnaces must be tested on the following points:
  - a. good condition of the frame of electrode holders and the hoisting equipment for electrodes; faulty condition of the frame causes lateral and vertical vibration, weakens the electrode connections, and results in the breaking of nipples
  - b. correct position of the sealing plates of economizers; if the economizer plates are incorrectly placed, the electrodes may be jammed and, as a result, broken.
5. When installing newly assembled electrodes, one must closely watch the vertical position of the electrode holder supports and the coinciding position of the centers of electrode holders and roof openings, so that in moving the electrode it will not brush against the bricks of the furnace roof and be subject to damage.
6. When a furnace is started on newly installed phases, it should be operated at reduced capacity, gradually heating up the electrodes.
7. In the event of a prolonged break in the operation of the furnace, the electrodes must be taken out of the furnace and cooled off until they are black.
8. It is not permitted to install electrodes in a furnace which is defective in any respect and does not meet anyone of the requirements listed above.

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Building Up of Electrodes

The building up of electrodes is one of the most complicated and responsible operations, and demands special care and skill on the part of the workers. The building up of electrodes should be done on the furnace or on a special stand. Before joining the electrodes together, they must be carefully inspected to make sure that they have no cracks, chipped ends, or blisters. The nipple and nipple socket should also be carefully inspected.

Individual Operations in Joining Electrodes

- a. The nipple sockets are nipples of electrodes ready for joining should be carefully blown out with compressed air to remove dust, dirt, and other impurities.
- b. The nipple must be carefully screwed into the old electrode.
- c. The metal nipple must be screwed into the new electrode, which is hoisted to the furnace or stand by crane.

It is advisable to use a metal nipple with an eye bolt, the pitch of thread being the same as the pitch of thread of the nipple connection. The use of such a nipple makes it possible to join the electrodes without lowering the electrode by crane.

- d. The electrode which is to be screwed on should be placed absolutely vertical above the old electrode and lowered gradually until the neck of the nipple enters the nipple socket in the upper part of the old electrode.
- e. The upper electrode should then be rotated slowly, without jerking, screwing it on to the lower electrode until the clearance in the joint measures 3-5 mm for graphitized electrodes and 15-20 mm for carbon electrodes. The screwing together is completed with the aid of a special key. It is not permitted to clamp the joint between two electrodes with the jaws of electrode holders.

Furnace Charge

- a. In charging the furnace, the electrodes must be raised to a height permitting furnace charging without touching the electrodes.
- b. The furnace charge must take place in accordance with technological instructions. It is not permitted to charge the furnace with ingots, slabs, and other large pieces of steel, not broken up into standard sizes.
- c. A finely crushed charge is placed immediately below the electrodes, on top of the regular furnace charge, for a better ignition of the electric arc, and when turning on the cooled furnace after a repair period, it is desirable to place lumps of coke under the electrodes.

Smelting

- a. Smelting must be done in accordance with the definite electrical process established by instructions.
- b. In the event of frequent breaking of the arc, the craters under the electrodes should be filled up with shavings or fine charge.
- c. As the smelting of the charge progresses, the large-sized charge should be moved from the sides of the furnace to the center to prevent caving-in, which might cause damage to the electrodes.

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d. During the smelting process, the electrode holders should be tightened from time to time, making use of the time when the current is switched off for moving the charge to the center of the furnace and for drawing off the slag, and if necessary (sparking in the contacts), the current should be specially disconnected.

e. In feeding the ore and ferroalloys into the furnace, they should not be allowed to hit against the electrodes.

f. It is necessary to maintain the perfect condition and working order of the automatic device for controlling the movement of electrodes. When refining metal in an electric furnace, one should closely watch the position of the electrodes, not permitting them to be dipped into the smelted metal, which might cause carbonizing of the bath and increased electrode consumption.

g. When tilting the furnace during the discharge of the melt, the electrodes should be raised in such a way that the junction of two electrodes is in the roof area, or not far from the roof, to prevent any damage to the electrodes.

#### Supplement to Instructions

In joining two carbon electrodes, it is necessary to use a special paste to assure a firmer contact; this paste is manufactured by electrode plants and is delivered in complete shipments with the carbon electrodes.

The paste should be applied to the nipple sockets after they have been blown out with compressed air.

The paste is a plastic material consisting of graphite powder, a low-temperature coke bond, and water. The paste must be stored in a place free from dust and dirt. If the paste dries out in the warehouse, it may be reconditioned by adding a small quantity of water.

The following rules for the use of paste in assembling carbon electrodes are recommended:

a. Before use, the paste should be stirred in the container in which it was delivered. A quantity of paste sufficient for several joining operations should be poured into a bucket and mixed with water to a creamy consistency.

b. If the electrode in the furnace is too hot, it is recommended that the paste be diluted with a cheap brand of molasses, as it may happen that in using water the quickly forming steam could force the paste out of the electrode joint.

c. The diluted paste should be applied to the upper end of the pin by hand or with a paintbrush.

d. Two-thirds of the nipple should be dipped into the paste; after taking it out, it should be held over the bucket to let the excess paste drip off.

e. The end surfaces of the electrodes should be covered with a thin layer of paste. This layer, together with the excess paste from the nipple sockets, should completely cover the electrode ends.

It is suggested that the newly built-up electrode be left to stand on the furnace above the electrode holder jaws for not less than the duration of one melt.

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## VI. List of Offices and Warehouses of Glavmetallobyt

(Address of "Glavmetallobyt": Moscow, 31, Kuznetskiy most, 12; telegrams may be sent to: Moscow, Glavmetallobyt).

Code No	Name of Office or Warehouse	Mailing Address*	Area of Operation	
			For Ferrous Metals and Metal Products	For Nonferrous Metal Products
01	Leningrad Office Leningrad Base No 1 Leningrad Warehouse No 2 Tallin Warehouse	Leningrad, ul. Brodskogo, 4 Leningrad, 19, Glukhozerskoye shosse, 1 Leningrad, 92, Novosivkovskaya, 35 Tallin, ul. Suur-Kar'ya 5/3	Leningrad, Murmansk, Novgorod, and Pskov oblasts; Karelo-Finnish and Estonian SSR	Leningrad, Murmansk, Novgorod, and Pskov oblasts; Karelo-Finnish and Estonian SSR
02	Moscow Office Moscow Base No 1 Moscow Warehouse No 2 Moscow Warehouse No 3 for Metal Products Moscow Warehouse No 4 for Non-ferrous Metals Tula Warehouse Kalinin Warehouse Ivanovo Warehouse Yaroslavl Warehouse	Moscow, 31, Kuznetskiy most, 12 Moscow, Main Post Office, P.O. Box 759 Moscow, 15, 4-y Vyatskiy per., 16/18 Moscow, Vostochnaya ul., 1 Moscow, proyezd Kuybysheva, 8/3 Tula, ul. Engelsa, 10 Kalinin, ul. B. Samara, 88a Ivanovo, Glinishchevo, P.O. Box 31 Yaroslavl, Komenskaya ul., 12	Arkhangel'sk, Bryansk, Velikiye Luki, Vladimir, Vologda, Ivanovo, Kalinin, Kaluga, Kostroma, Kursk, Moscow, Orel, Ryazan', Smolensk, Tula, and Yaroslavl' oblasts	Arkhangel'sk, Baranovichi, Bobruysk, Brest, Bryansk, Velikiye Luki, Vitebsk, Vladimir, Vologda, Voronezh, Gomel', Grodno, Ivanovo, Kalinin, Kaluga, Kostroma, Crimean, Kursk, Minsk, Mogilev, Molodechno, Moscow, Orel, Pinsk, Poles'ye, Polotsk, Ryazan', Rostov, Smolensk, Tambov, Tula and Yaroslavl' oblasts; Krasnodar Kray; Latvian and Lithuanian SSR
03	Gor'kiy Office Gor'kiy Warehouse Kazan Warehouse	Gor'kiy, ul. Sverdlova, 15 Gor'kiy, Moskovskoye shosse, pos, Kostarikha Kazan, ul. Bauman, 16	Gor'kiy and Kirov oblasts; Komi, Mari, Tatar, and Chuvash ASSR	Gor'kiy and Kirov oblasts; Komi, Mari, Tatar, and Chuvash ASSR

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Code No	Name of Office or Warehouse	Mailing Address*	Area of Operation	
			For Ferrous Metals and Metal Products	For Nonferrous Metal Products
	Kirov Warehouse	Kirov, oblast warehouse, Pristanskaya ul., 11		
04	Voronezh Office	Voronezh, Komin-ternovskiy rayon, ul. 10-letiya Oktyabrya, 73	Voronezh and Tambov oblasts	
	Voronezh Warehouse	Voronezh, Komin-ternovskiy rayon, ul. 10-letiya Oktyabrya, 73		
05	Belorussian Office	Minsk, ul. Rozy Lyuksemburg, 69	Baranovichi, Bobruysk, Brest, Vitebsk, Gomel', Grodno, Minsk, Mogilev, Molodechno, Pinsk, Poles'ye, and Polotsk oblasts	
	Minsk Warehouse	Minsk, ul. Pushkina, 58a		
06	Kharkov Office	Kharkov, dom Gosproma, 1st entrance, 1st floor	Poltava, Sumy, and Kharkov oblasts	
	Kharkov Warehouse	Kharkov, Zmiyevskaya ul., 125		
07	Sverdlovsk Office	Sverdlovsk, dom Promyshlennosti, 3d unit, 2d floor	Omsk, Sverdlovsk, and Tyumen' oblasts	Akmolinsk, Karaganda, Kokchetav, Kurgan, Kustanay, Molotov, Omsk, Sverdlovsk, Severo-Kazakhstan, Tyumen', and Chelyabinsk oblasts; Bashkir and Udmurt ASSR
	Sverdlovsk Warehouse	Sverdlovsk		
	Sverdlovsk Warehouse for Nonferrous Metals	Sverdlovsk-Shartash		
	Nizhniy Tagil, Base	Nizhniy Tagil, Zavyazovskiy poselok		
	Omsk Warehouse	Omsk, Moskovskaya, 13		
08	Kiev Office	Kiev, Vladimirskaia ul., 42	Vinnitsa, Volyn', Drogoibych, Zhitomir, Transcarpathian, Kamenets-Podol'skiy, Kiev, L'vov, Rovno, Stanislav, Ternopol', Chernigov, and Chernovtsy oblasts	Vinnitsa, Volyn', Voroshilovgrad, Dnepropetrovsk, Drogoibych, Zhitomir, Transcarpathian, Zaporozh'ye, Izmail, Kamenets-Podol'skiy, Kiev, Kirovograd, L'vov, Nikolayev, Odessa, Poltava, Rovno, Stalino, Stanislav,
	Kiev Warehouse	Kiev, P.O. Box 97		
	Kiev Warehouse for Metal Products	Kiev, Vladimirskaia ul., 42		
	Kiev Warehouse for Nonferrous Metals	Kiev, ul. Voroshilova, 28		

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Code No	Name of Office or Warehouse	Mailing Address*	Area of Operation	
			For Ferrous Metals and Metal Products	For Nonferrous Metal Products
				Sumy, Ternopol', Khar-kov, Kherson, Cherni-gov, and Chernovtsy oblasts; Moldavian SSR
09	North Caucasus Office Rostov Ware-house	Rostov-on-Don, ul. Engel'sa, 15 Rostov-on-Don, 14. liniya, ugol Oktyabr'skoy ul.	Groznyy and Rostov oblasts; Krasnodar and Stavropol' krays; Dagestan, Kabardin, and North-Osetian ASSR	
10	Kuybyshev Office Kuybyshev Warehouse	Kuybyshev, ul. Bentseka, 32 Kuybyshev, p/otd.23, pos. Bezymyanka	Kuybyshev, Penza and Ul'yankovsk oblasts; Mordva ASSR	Aktyubinsk, Astrakhan', Gur'yev, Zapadno-Kazakhstan, Kzyl-Orda, Kuybyshev, Penza, Saratov, Stalingrad, Ul'yankovsk, Chkalov, and Yuzhno-Kazakhstan oblasts; Stavropol' Kray Mordva ASSR; Kirgiz, Tadzhik, Turkmen, and Uzbek SSR
11	Chelyabinsk Office  Chelyabinsk Warehouse Ufa Ware-house Chkalov Warehouse	Chelyabinsk, ul. Vorovskogo 2, 2d floor, left wing Chelyabinsk, ul. Ordzhonikidze, 2 Ufa, Kustovoy vyselok, 3 Chkalov, Krasnyy gorodo, P.O.B.4	Kurgan, Kustanay, Chelyabinsk and Chkalov oblasts, and Bashkir ASSR	
12	Azerbayd-zhan Baku Ware-house	Baku, ul. Khagani, 42 Baku, Kishly	Azerbaydzhian SSR	--
13	Novosibirsk Office  Novosibirsk Warehouse Novosibirsk Warehouse for Metal Products Krasnoyarsk Warehouse	Novosibirsk, Krasnyy prospekt, 13 Station Inskaya, Tomsk RR System. Novosibirsk, Krasnyy prospekt, 13 Krasnoyarsk, ul. Robesp'yera, 19	Kemerovo, Novosibirsk and Tomsk oblasts; Altay and Krasnoyarsk krays; Tuva A.O.	Alma-Ata, Vostochno-Kazakhstan, Dzham-bul, Irkutsk, Kemerovo, Novosibirsk, Pavlodar, Sakhalin, Semipalatinsk, Taldy-Kurgan, Tomsk, and Chita oblasts; Tuva A.O.

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Code No	Name of Office or Warehouse	Mailing Address*	Area of Operation	
			For Ferrous Metals and Metal Products	For Nonferrous Metal Products
	Barnaul Warehouse	Barnaul, Altay Kray		Altay, Krasnoyarsk, Primorskiy, and Khabarovsk krais; Buryat-Mongol and Yakut ASSR
14	Uzbek Office	Tashkent, ugol ul. Zhukovskogo i Kuybysheva, 71/20	Kirgiz, Tadzhik, Turkmen, and Uzbek SSR	
	Tashkent Warehouse	Tashkent, ul. Shota Rustaveli, 105		
	Frunze Warehouse	Frunze, Kirgizskaya ul., 34		
	Ashkhabad Warehouse	Ashkhabad, Proyekt-naya ul., 2		
	Stalinabad Warehouse	Stalinabad, pose-lok Kirova, 28		
15	Kazakh Office	Alma-Ata, Issyk-kul'skaya ul., 64	Akmolinsk, Aktubinsk, Alma-Ata, Vostochno-Kazakhstan, Gur'yev, Dzhambul, Karaganda, Kzyl-Orda, Kokchetav, Pavlodar, Severo-Kazakhstan, Semipalatinsk, Taldykurgan, and Yuzhno-Kazakhstan oblasts	
	Alma-Ata Warehouse	Alma-Ata, Issyk-kul'skaya ul., 64		
	Karaganda Warehouse	Karaganda, Staryy gorod		
	Petropavlovsk Warehouse	Petropavlovsk, Kazakh SSR		
16	Georgian Office	Tbilisi, ul. Bor'by, 77	Georgian SSR	Groznyy Oblast; Dagestan, Kabardin, and North-Osetian ASSR; Azerbaydzhan, Armenian, and Georgian SSR
	Tbilisi Warehouse	Tbilisi, ul. Bor'by, 77		
17	Stalingrad Office	Stalingrad, 19	Astrakhan' and Stalingrad oblasts	
	Stalingrad Warehouse	Stalingrad, 19		
	Astrakhan' Warehouse	Astrakhan', Boldinskoye shosse, 5		

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Code No	Name of Office or Warehouse	Mailing Address*	Area of Operation	
			For Ferrous Metals and Metal Products	For Nonferrous Metal Products
20	Dnepropetrovsk Office Kaydaki Base	Dnepropetrovsk, ul. K. Libk-nekhta, 9 Dnepropetrovsk, N. Kaydaki, ul. Kvitki, 5	Dnepropetrovsk, Zaporozh'ye and Crimean oblasts	
21	Donbass Office Nikitovka Base Stalino Base	Stalino, Donbass, ul. Chelyuskintsev, 184 Nikitovka, Donbass Stalino, Donbass, Vetka Mine, "Glav-metallosbyt" Base	Voroshilovgrad and Stalino oblasts	
22	Yerevan Office Yerevan Warehouse	Yerevan, ul. Shaumyana, 3 Yerevan, ul. Shaumyana, 3	Armenian SSR	
23	Irkutsk Office Irkutsk Warehouse Ulan-Ude Warehouse	Irkutsk, ul. Krasnoy Zvezdy, 18 Irkutsk, ul. Krasnoy Zvezdy, 18 Ulan-Ude, Traktovaya ul., 12a	Irkutsk and Chita oblasts; Buryat-Mongol and Yakut ASSR.	
26	Far East Office Khabarovsk Warehouse Vladivostok	Khabarovsk, ul. Kalinina, 37 Khabarovsk 2-y, P.O. Dep. 17, P.O. Box 4/64 Vladivostok, Lesnoy per. 8	Sakhalin Oblast; Primorskiy and Khabarovsk krays	
27	Saratov Office Saratov Warehouse	Saratov, P.O. Box 33 Saratov, P.O. Box 33	Zapadno-Kazakhstan and Saratov oblasts	
28	Odessa Office Odessa Warehouse	Odessa, ul. Bogatogo, 79 Odessa, ul. Bogatogo, 79	Izmail, Kirovograd, Nikolayev, Odessa, and Kherson oblasts; Moldavian SSR	
29	Molotov Office Molotov Warehouse	Molotov, ul. Lunacharskogo, 43 Station Kislotnyy, Perm Perm RR System	Molotov Oblast and Udmurt ASSR	

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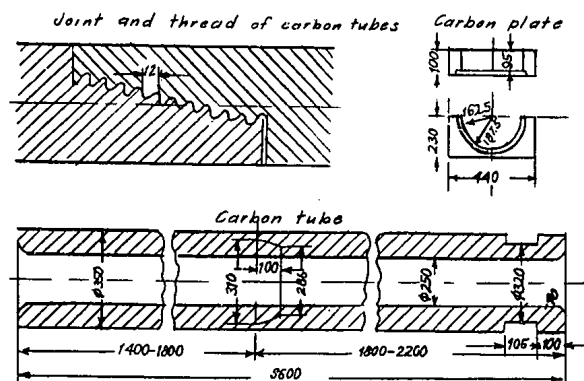
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Code No	Name of Office or Warehouse	Mailing Address*	Area of Operation	
			For Ferrous Metals and Metal Products	For Nonferrous Metal Products
30	Latvian Office	Riga, ul. Kal'- kyu, 5	Kaliningrad Oblast; Latvian and Lithuan- ian SSR	
	Riga Ware- house	Riga, ul. Stren- chu, 3		

\* The telegram address for all offices, except Moscow, is the name of the city and the word "Glavmetallobyt;" the Moscow office telegram address is "Moscow-Mosmetallobyt."

[Appended figures follow.]

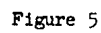
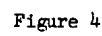
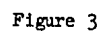
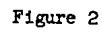
Figure 1



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